

Relative Susceptibility of Various  
Tree Species to Isolates of Armillaria

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Final Report  
for  
Cooperative Project 28-C9-497

January 24, 1992

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EXPERIMENT STATION

The resistance of forest tree species to *Armillaria* root disease is suspected within the genotypes occurring in the South West. The identification and utilization of these resistant species would give forest managers a means of keeping root disease centers forested. The Jemez Ranger District of the Santa Fe National Forest is an area where this information is needed because it has a high incidence of *Armillaria* root disease. A pathogenicity test was established to determine if any tree species common to the area were resistant to *Armillaria* sp. Isolates of *Armillaria* from the Jemez area were used to screen seedlings for resistance.

The objective of this cooperative project was to:

To establish, maintain, and record data from a pathogenicity test using eight or more isolates of *Armillaria* collected from the Jemez Mountains in New Mexico. All isolates will be tested on aspen, blue spruce, ponderosa pine, southwestern white pine, true fir and Douglas-fir, and western larch.

#### Test Facility:

A shade house was constructed in the spring of 1989 to house the pathogenicity trials. The house was 16 feet wide and 24 feet long and 8 feet high. The structure was constructed out of treated poles, rough cut and treated 2 X 8, 2 X 4, and 1 X 4's. The shade material was slatted snow fence. A four zone automatic watering system with overhead heads was installed to insure even watering. Weed barrier cloth was laid on 2-6 inches of gravel and the potted trees placed on the cloth. Top soil was placed around all the pots and in the rows between replications to reduce temperature and moisture fluctuations in the soil.

#### Plant Sources:

Bare root and container grown 2/0 and 3/0 seedlings of western larch, blue spruce, aspen, lodgepole pine, white fir, Douglas fir, ponderosa, and S. W. white pine were used in this study. The seedlings came from various sources and seed zones (Table 1). The seedlings were potted in 1 gallon black plastic pots using a commercial peat potting mix (Fafard Growing Mix #2) on April 15, 1989.

#### Fungus Source:

Thirteen isolates of *Armillaria* sp. were used in this test. The isolates were obtained on the Jemez District from ponderosa pine, southwestern white pine, blue spruce, Douglas-fir, white fir, and aspen. The isolate numbers were WF1, WF2, BS1, BS2, DF1B, DF2, WP1, WP2, PP1, PP3, PP4, A2, and A4. The inoculum consisted of colonized red alder sticks. One hundred and fifty one quart glass canning jars were filled with 10-12 cm long sticks of 2-3 cm in diameter. After alder sticks were placed in jars, sterile distilled water was added and the jar filled three quarters full. The jars were allowed to sit 24 hours so the sticks could soak up water. Jar lids were replaced with glass filter disks to aid air exchange. Jars were sterilized in an autoclave for two hours and cooled slowly to prevent jars from cracking. Sterilized malt extract liquid media (30 g malt extract, 5 g bacto-peptone, 20

g dextrose in 1000 ml distilled water) was added to the jars while media was still hot. After the media had cooled, jars were seeded with fungus by adding 5, 5 mm diameter plugs of the fungus from cultures grown on solidified (19 g agar) malt extract agar. Sterile distilled water was added as needed over the next 3 months to replace water lost due to evaporation so that 1 inch of water remained in the jars.

#### Inoculation:

A 3/4 inch plastic pipe section was placed next to the seedling during planting. The pipe was removed and an appropriate inoculum stick placed in the hole on May 20, 1989. The pots were placed in a totally random system within 15 blocks. The 15 replications of 8 tree species in combination with 14 treatments (13 isolates and 1 control) for a total of 1680 seedlings.

#### Pathogenicity Assessment:

The inoculated seedlings were assessed weekly for symptoms of root disease between May 20, 1989 to September 1991. The trees that died during this period were removed and symptoms and signs of root disease were recorded. In September of 1991 the remaining trees were removed from the shade house and rated for infection, condition of inoculum, and various other parameters of tree size and health were collected. Isolations were made from 120 trees.

Both the root and inoculum stick were isolated from if the tree was infected and isolations only from the inoculum stick if there were no infections. Sixty four successful isolations were made and crosses with original isolates are being evaluated to see if there was any movement of isolates among trees.

All data on infection, condition of inoculum, health and size of the trees are entered and will be analyzed this spring. Data are file with the Rocky Mt Range and Experiment Station. Most trees survived the test even though many were infected. Observations indicated the isolates varied in pathogenicity and that there were differences in resistance among the tree species. Final data analysis is needed before any specific details are available. Data analysis will be completed under cooperative project 28-C1-553.

Table 1. Armillaria Isolates used in Pathogenicity Test

Isolates Used in Shade House Experiment	Not Used	Results Dip/Dip Test- Cross
WF1	PP5	Group 1WF1
WFS	A3	PP3
BS <sup>1</sup>	DF1a	Group 2DF 1a
BS <sup>2</sup>		DF 1b
DF2b		Group 3PP1
DF2		WP1
WP1		Group 4A4
WP2		Group 5WP2
PP1		Group 6A2
PP3		Group 7DF2
PP4		PP5
A2		PP4
A4		Group 8BS1
		Group 9BS2
		Group 10A3
		Group 11WF2

<sup>1</sup>Isolates PP1, PP4, A3, and A4 were used also in field inoculations on June 20, 1989. WF = White fir, BS = Blue Spruce, DF = Douglas fir, WP = White pine, PP = ponderosa pine, A = aspen.

<sup>2</sup>Isolate information and results of the Diploid/Diploid test-cross amongst field isolates are provided here. The group designation does not indicate clonal/specie relationship, rather, they indicate intersterility groups.

Table 2: Seedling Sources

Seedling	Nursery	Age*	Location	Elevation	Date	Batch #
Western Larch	Cour d'Alene	2/0 BR	Flathead	5,000	none	2783
Blue Spruce	Colo. State	2/0 BR	?	?		
Aspen	Colo. State	2/0 C	Cameron Pass, Zone 681	8,500	6/87	none
Lodgepole	Bessey	2/0 BR	Pike-San Isabel, Zone 496 Dist. 10	10,500	62	Pico-02 -12-10 -496
White Fir	Wind River	2/0 BR	Dechutes Zone 681	6,000	74	none
Douglas-fir	Albq.	3/0 BR	Lincoln Zone 840	9,000	77	77034
Ponderosa	Albq.	2/0 BR	Gila Zone 170	No record	76	76008
S. W. White Pine	Albq.	2/0 BR	Lincoln Zone 840	No record	76	76013

\*BR Bare root

C containerized

? No information available